THE INFLUENCE OF METHANOL IN WATER ICE ON THE DISTRIBUTION OF VOLATILE CARBON-CONTAINING PHOTOPRODUCTS

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Recent JWST observations of icy grains in molecular clouds have highlighted the complexity of organic chemistry developing in water ice at the early stages of star formation. Following the chemical evolution of icy grain mantles as stars form can provide clues about the observed compositions of comets and icy planetary bodies. We deposited ice mixtures of water and methanol in varying ratios under cryogenic, ultrahigh vacuum conditions. We monitored the chemical composition of the ice mixtures during UV photolysis and their sublimated products during subsequent controlled warmup using infrared spectroscopy in transmission, quadrupole mass spectrometry, and rotational spectroscopy in the mm/submm-wave regime. Here we highlight the impact of the water:methanol ratio on the production of various carbon-containing volatiles (carbon dioxide, carbon monoxide, methane, formaldehyde, and the formyl radical). We find that higher proportions of water favor the production of more highly oxidized carbon-containing volatiles over their reduced counterparts.